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Development of a predictive model of shell disease for inshore lobster fisheries: A case study in Long Island Sound.

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The expansion of epizootic shell disease (ESD) has become an emerging threat to the inshore lobster fisheries in the northeastern United States. The development of models to improve the efficiency and precision of existing monitoring programs has been advocated as an important step in mitigating its harmful effects. The objective of this study is to construct an ecological model that could enhance the existing monitoring effort through (1) identification of potential infection-promoting abiotic and biotic agents, and (2) estimation of spatial variation in disease prevalence in the lobster fishery. A delta-generalized additive modeling (GAM) approach was applied using bottom trawl survey data collected from 2001-2013 in Long Island Sound, a tidal estuary between New York and Connecticut states. The results showed that spatial distribution of ESD prevalence was strongly influenced by the interactive effects of latitude and longitude, possibly indicative of a geographic origin of shell disease. Bottom temperature, bottom salinity, and depth were also important factors affecting the spatial variation in ESD prevalence. The delta-GAMs estimated high disease prevalence in un-surveyed locations. Additionally, a significant spatial discrepancy was found between modeled disease hotspots and survey-based gravity centers of disease prevalence. This study provides a modeling framework to enhance research, monitoring and management of emerging and continuing marine disease threats, providing a valuable tool for the management of the inshore lobster fisheries in the Northwest Atlantic.

Keywords: American lobster, Generalized Additive Model, Long Island Sound, Epizootic Shell Disease

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